



BOEING PRODUCT STANDARDS GROUP MEETING

SEPTEMBER 12, 2001

NASA TECHNICAL STANDARDS PROGRAM OVERVIEW

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NASA TECHNICAL STANDARDS PROGRAM



OVERVIEW

Technical Standards have been an integral part of NASA Programs and Projects developments and operations since the Agency was established in 1959. However, for years each Center was responsible for its own development and selection of non-NASA technical standards that met the needs of Programs and Projects for which they were responsible. There were few “Agencywide” applicable Technical Standards, mainly those in area of safety. Department of Defense Standards and Specifications were the foundation and main source for Technical Standards used by the Agency. This process existed until about 1997 when NASA embarked on a Program to convert NASA’s Center-developed Technical Standards into Agencywide endorsed NASA Preferred Technical Standards and the formal adoption of non-NASA Technical Standards (DOD, SAE, ASTM, ASME, IEEE, etc.) as NASA Preferred Technical Standards.

Technical Standards are important to the Agency for many reasons. For example, they are used in contract proposal reviews to verify inputs, in-house design and development actions, supporting contractor use, to capture lessons learned and new technology, and to maintain engineering excellence in research and development and operations. They provide a common base for interoperability. As noted by Greg Saunders, Director of the Department of Defense Standardization Program Office, interoperability and standardization are connected just as thunder and lightning. Lightning causes thunder, and the “right” type of standardization and standards results in the interoperability the Agency needs to win on the development and operation of spacecraft and associated instrumentation.



NASA TECHNICAL STANDARDS PROGRAM



Overview (Cont'd)

The NASA Technical Standards Program now has several key elements. They include the development of NASA-unique Technical standards; formal adoption of non-NASA Technical Standards, especially those developed by Voluntary Consensus Standards Developing Organizations; conversion of NASA's Center-developed Technical Standards and, of considerable importance to the Agency's Programs and Projects, the development of NASA's Integrated Technical Standards Initiative. This unique Initiative resulted from interactions with many Managers and staff members of NASA Programs and Projects, plus individual engineering staff members of the Centers. The three focal points of the Initiative consist of the Agencywide Full-text Technical Standards System, Standards Update Notification System, and the Lessons Learned/Best Practices/Application Notes – Integrated Standards System. All of these Systems have been implemented and their further development and enhancement to meet the Agency's engineering needs continues as experience and feedback are obtained from the users.



NASA TECHNICAL STANDARDS PROGRAM



OUTLINE

- 1. Background and Context**
- 2. Goals and Authority**
- 3. Functional Diagram for the NASA Technical Standards Program**
- 4. Key Program Initiatives**
- 5. Status of Agency-Wide Preferred Technical Standards (Development and Adoption)**
- 6. NASA Integrated Technical Standards Initiative**
- 7. Agency-Wide Full-Text Technical Standards System/Standards Update Notification System**
- 8. Lessons Learned/Best Practices/Application Notes – Standards Integration System**
- 9. Program Website Overview**
- 10. Where Do We Go From Here?**
- 11. Summary Chart**
- 12. Back-Up Charts**

PROGRAM WEBSITE DEMONSTRATION



NASA TECHNICAL STANDARDS PROGRAM



BACKGROUND AND CONTEXT

- **Traditionally, NASA “technical standards” were built around specific programs and organizations, e.g.,**
 - Apollo, Shuttle, Space Station, Explorers...
 - NASA Field Centers - MSFC, JSC,...
- **Liberal use was made of MIL-STD's. Agency-wide technical standards were generally limited to specific areas:**
 - Safety, Mission Assurance, Electronic Components
 - Construction of Facilities
 - Data Communications Standards
- **Technical Standards were prescriptive and essentially “good forever”**
- **Establishment and use of an Agency-wide Technical Standards Program has been established.**



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GOALS AND AUTHORITY

Goals:

- Improve and Maintain NASA's Engineering Capability
 - Capture and Preserve Engineering Lessons Learned and Best Practices
 - Facilitate the Insertion of Technology into all NASA Programs/Projects
- Ref: NASA Strategic Plan, Provide Aerospace Products and Capabilities (PAPAC)

Authority:

- NASA Policy Directive (NPD 8070.6), "Technical Standards", October 10, 1997 NASA Preferred Technical Standards Program Plan, April 15, 1999
- NASA NPG 7120.5, "NASA Programs and Project Management Processes and Requirements", April 3, 1998
- Public Law 104-113, "National Technology Transfer and Advancement Act of 1995"
- OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and Conformity Assessment Activities" (Revised February 10, 1998)

Delegation of Authority:

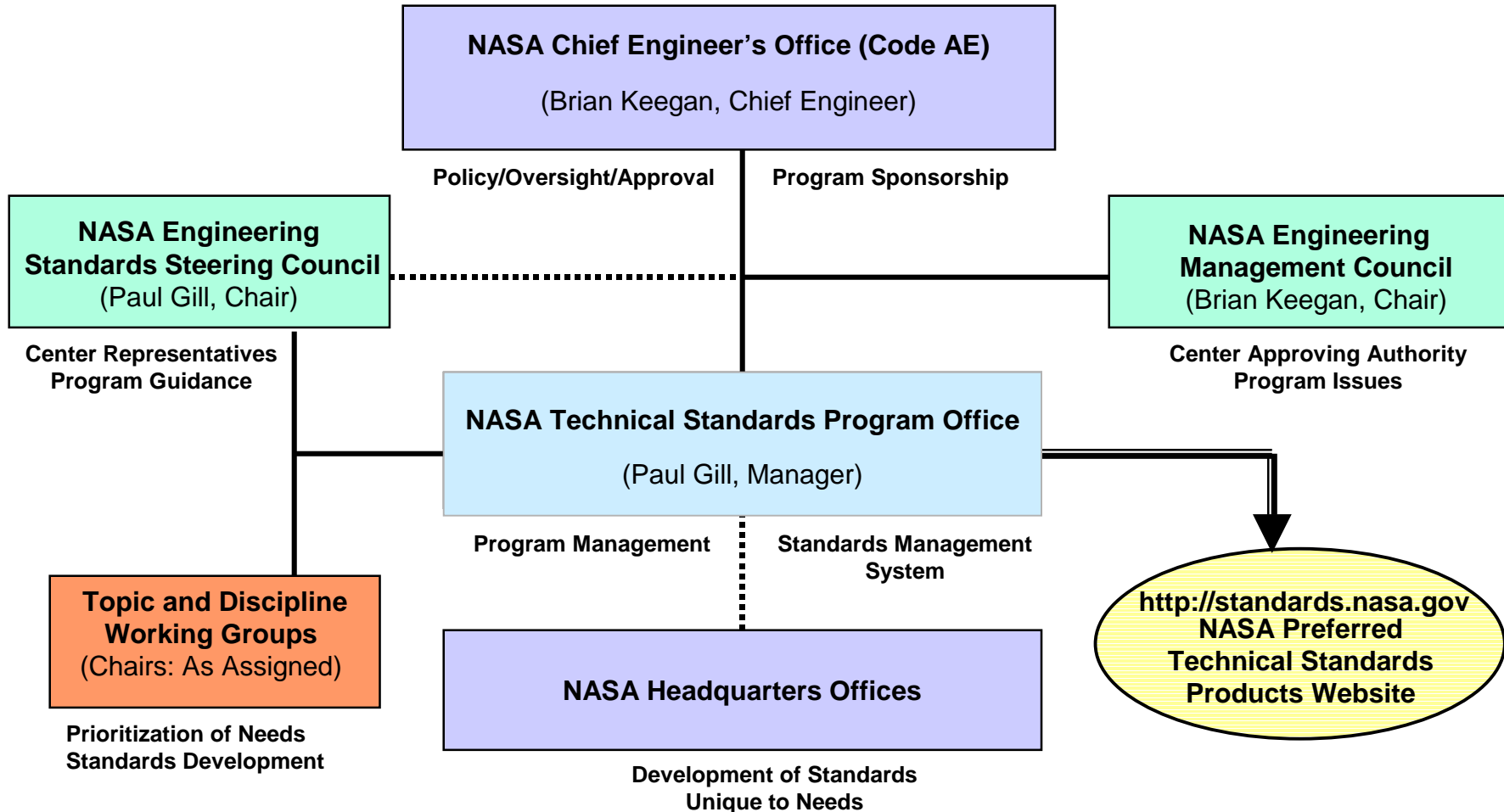
- Marshall Space Flight Center Designated as the Agency's Lead Center for the NASA Technical Standards Program



NASA TECHNICAL STANDARDS PROGRAM



FUNCTIONAL DIAGRAM FOR THE NASA TECHNICAL STANDARDS PROGRAM





NASA TECHNICAL STANDARDS PROGRAM



MAJOR PROGRAM ELEMENTS

- **NASA-Unique Standards Development Initiative**
- **Conversion of Center-Developed Standards to NASA Preferred Technical Standards (NASA or Non-Government) Initiative**
- **Voluntary Consensus Standards (Non-Government) Adoption and Development Initiative**
- **Standardization Awareness Initiative**
- **NASA Integrated Technical Standards Initiative**
 - **Agency-wide Full-text Technical Standards System**
 - **Standards Update Notification System (SUNS)**
 - **Lessons Learned/Best Practices/Application Notes - Standards Integration System**



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STATUS OF AGENCY-WIDE PREFERRED TECHNICAL STANDARDS **(Development and Adoption)**

- **Engineering**
 - 15 NASA Standards Published, 15 in Development
 - 983 Standards Adopted From 40 Non-Government Voluntary Consensus Standards (VCS) Organizations
 - 357 Non-Government Standards Pending Adoption as “NASA Preferred Standards”
 - 91 Center-Developed Standards Identified as Candidates for Conversion to a NASA Standard or VCS
- **Safety and Mission Assurance**
 - 23 NASA Standards Published
- **Information Technology**
 - 18 NASA Standards Published
- **Data Communications**
 - 22 Consultative Committee for Space Data Systems (CCSDS) Standards Published/Adopted
- **Facility Construction**
 - Linked to SPECSINTACT system with >4000 standards
- **NASA Personnel Involved in the Development of Over 145 National and International Standards Developing Organizations, Committees and Working Groups**



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NASA Integrated Technical Standards Initiative

- **Consists of Three Agency-wide (Full Text, Update Notification, Lessons Learned - Standards Integration) Systems**
- **Uniqueness is the Integration of Three Systems Into One Focused Web Site (“One-Stop Shop”) for Agency’s Engineering Applications**
- **Provides an Agency-Wide Asset Accessible by All Field Centers, JPL, and Headquarters Employees, plus On-Site Support Contractors**
- **Minimizes Agency Costs and Maximizes Technical Standards and Related Information for Use by Programs/Projects**
- **Metrics Will Enable Considerable Management Visibility on Agency’s Actual Technical Standards Usage and Needs**



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Agency-Wide Full-Text Technical Standards System

Accomplishments

- **Awarded Five-Year, Fixed Price Competitive Contract for System Inputs on 108 Domestic and International Standards Developing Organizations (SDOs) Full-Text Standards Products, Including NASA and DOD, PLUS Related Standards Information**
- **Updated Program Web-Site Format and Content**
- **Conducted System Check-Out and Developed Agency Phase-In Plan**
- **Phase In Use of System to 14 NASA Facilities (Nine Field Centers, JPL, Headquarters, WFF, WSTF, IV&V)**



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Agency-Wide Full-Text Technical Standards Systems (Cont'd)

Near Term Plans

- Promote System at Each Facility via News Releases and “Availability” Posters in Cooperation With ESSC Members and Local Scientific & Technical Information (STI) Representatives
- Monitor System Usage and Provide Upgrades to Meet Agency User Needs

Long Term Plans

- Expand Access to Additional Standards Related Information as Needed by Users
- Assess the Issues Associated with the Expansion of System Access for Use by Off-Site Contractors Working on NASA Programs/Projects



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Standards Update Notification System (SUNS)

Accomplishments

- Developed the System and Arranged for Necessary Inputs From an Update Notification Information Input Provider
- Obtained Update Notifications for the NASA Preferred Technical Standards.
- Conducted “Pilot” with Solid Rocket Booster – TVC Subsystem; Update Notifications Were Submitted by United Space Alliance at Direction of MSFC Shuttle Projects Office
- Conducted “Pilot” with NPOESS Preparatory Project, NPP Spacecraft and Advanced Technology Microwave Sounder (ATMS) Instrument, in Cooperation with GSFC.



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Standards Update Notification System (SUNS) (Cont'd)

Near Term Plans

- Provide SUNS to ALERT Committee for Beta Testing
- Utilize the Agency-wide Full-Text Technical Standards System for Updated Standards Product Acquisition
- Open to Remaining NASA Facilities – Goal by Mid-October

Long Term Plans

- Work With Agency's Standards Products Owners to Incorporate Additional Standards Update Notification Information (For Example, Center Multiprogram/Project Documents, S&MA Standards Products)
- System Maintenance and Improvement, Especially Implementation of a Standards Change Assessment Effort to Support Agency Programs/Projects
- Support ALERT Committee Activities



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Standards Update Notification System (SUNS) (Cont'd)

Standards Change Assessment Effort

- **Includes Screening and Identifying Editorial and/or Technical Changes Made in New Standards Products Versus Content of Standards Products Superseded or Replaced**
- **Very Few Standards Developers Identify Changes Made**
- **Significant Value of Information is to Save Time and Costs Associated with Decision on Making Any Program/Project Impact Analysis Regarding Change In Standard**
- **Once Done, Change Assessment Information Would be Put on Program Website and Provided to All Users Via Standards Update Notification System**
- **Effort Not Currently Covered in NASA Technical Standards Program Budget. Assistance from Programs/Projects Planned. We Anticipate a Couple of Years Phase-Over**



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LESSONS LEARNED/BEST PRACTICES/APPLICATION NOTES – STANDARD INTEGRATION SYSTEM

Accomplishments

- **Lessons Learned/Best Practices Sites Currently On-line**
 - **85+ Links to Various NASA, Other Government, and Non-Government Aerospace Engineering Related Sites Via the Program's Website (nasa.gov domain)**
- **NASA's Lessons Learned Information System (LLIS)**
 - **100+ Lessons From LLIS Have Been Linked to 60+ NASA Preferred Technical Standards to Date. These are Available via the Program's Website (nasa.gov domain)**
- **Integrated NASA Preferred Technical Standards Products Application Notes, as Provided by JPL, etc., and Made Available on Program Website Within <nasa.gov> Domain**



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LESSONS LEARNED/BEST PRACTICES/APPLICATION NOTES – STANDARD INTEGRATION SYSTEM (Cont'd)

Near Term Plans

- **Begin the Process of Linking the 85+ Databases to Applicable NASA Preferred Technical Standards With Initial Action on NASA Centers' Databases. Scheduled to be Completed by December 2001**
- **Address the Issue of Gathering System Products Usage Metrics**
- **Improve Process for Acquisition of Application Notes From Standards Users Within Agency, Including Supporting Contractors**



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LESSONS LEARNED/BEST PRACTICES/APPLICATION NOTES – STANDARD INTEGRATION SYSTEM (Cont'd)

Long Term Plans

- **Address the Issue of Linking NASA Technical Manuals/Reports to Applicable Standards**
- **Periodic Review of LLIS to Capture Any New Lessons Learned**
- **Periodic Search of Internet for Additional Lessons Learned/Best Practices Database Sites with Aerospace Engineering Applications**
- **Assess Value to Programs/Projects of the Lessons Learned/Best Practices/ Application Notes – Standards Integration System**
- **NASA Preferred Technical Standards Update Actions Based on Lessons Learned/Best Practices/Application Notes Inputs**

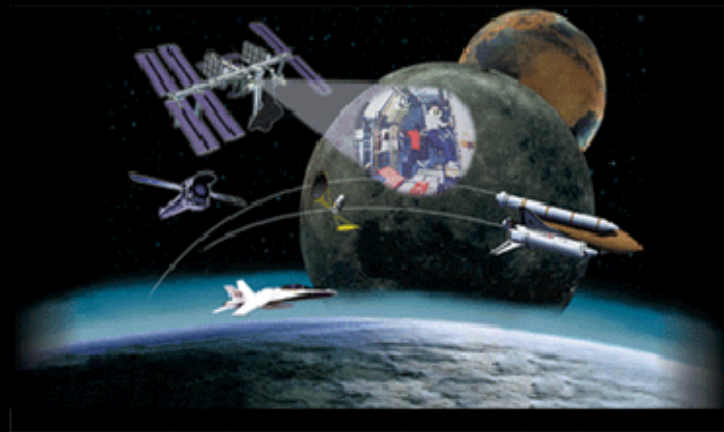


NASA Technical Standards Program

[Overview](#)[Supporting Documents](#)[Feedback](#)[Help](#)[Disclaimer](#)

NASA Access (Logon Required)

- Agencywide Full-Text Technical Standards System (Access To NASA Preferred & Other Technical Standards Products)
- Standards Update Notification System (In Beta Testing)
- Document Management System
- NASA Participation In Committees & Working Groups
- Standards Developing Organizations
- Lessons Learned / Best Practices



Public Access (Logon Required)

- NASA Preferred Technical Standards Products
- Standards Developing Organizations
- Lessons Learned / Best Practices

What's New

Milspec Reform Final Report, An Ending: A New Beginning, April 2001

Technical Standards And The Aerospace Industry

Four New NASA Preferred Technical

Sponsored By: Office Of The NASA Chief Engineer

Program Manager: [Paul Gill](#)

Website Manager: [Brenda Lance](#)

Curator: [Kalpana Shiva](#)

This page modified on: June 14, 2001

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Document No.	Rev.	Date [Base] (latest change)	Title	Doc Status	No. of Pages	No. of NASA Accesses Since 06/2001	NASA Status	LL/BP & AN	SDO
MIL-STD-1686 <i>Base</i>	C	10/25/1995	ELECTROSTATIC DISCHARGE CONTROL PROGRAM FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES AND EQUIPMENT (EXCLUDING ELECTRICALLY INITIATED EXPLOSIVE DEVICES) (SUPERSEDING MIL-STD-1686B)	Active	19	4	Preferred	LL/BP AN	MIL
ISO1686 <i>Base</i>	1976		SODIUM AND POTASSIUM SILICATES FOR INDUSTRIAL USE - SAMPLES AND METHODS OF TEST - GENERAL	Active	4	0			ISO/CHEM
ASTM-D1686 <i>Base</i>	1996(R00)		STANDARD TEST METHOD FOR COLOR OF SOLID AROMATIC HYDROCARBONS AND RELATED MATERIALS IN THE MOLTEN STATE (PLATINUM-COBALT SCALE)	Active		0			ASTM
ASTM-E1686 <i>Base</i>	1996		STANDARD GUIDE FOR SELECTION OF ENVIRONMENTAL NOISE MEASUREMENTS AND CRITERIA	Active		0			ASTM
ASTM-F1686 <i>Base</i>	1997		STANDARD GUIDE FOR SURVEYS TO DOCUMENT AND ASSESS OILING CONDITIONS ON SHORELINES	Active		0			ASTM
BS-EN-1686 <i>Base</i>	1996	01/01/1996	EDI. MESSAGE. PURCHASE ORDER RESPONSE MESSAGE (ORDRSP)	Active		0			BS
CSA-Z168.6-M <i>Base</i>	1989	01/01/1989	OXYGEN ANALYZERS	Active	32	0			CSA

Summary page

MIL-STD-1686	Revision: C	Status: Active	NASA Status: Preferred
DoDISS info	No. of NASA Accesses since 06/2001: 4	SDO: MIL	Year Reaffirmed:
TITLE: ELECTROSTATIC DISCHARGE CONTROL PROGRAM FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES AND EQUIPMENT (EXCLUDING ELECTRICALLY INITIATED EXPLOSIVE DEVICES) (SUPERSEDING MIL-STD-1686B)			
Base	Date: 10/25/1995	19 pages	View Doc View TOC

Document Scope

[Base - 10/25/1995]

The purpose of this standard is to establish comprehensive requirements for an ESD control program to minimize the effects of ESD on parts, assemblies, and equipment. An effective ESD control program will increase reliability and decrease both maintenance actions and lifetime costs. This standard shall be tailored for various types of acquisitions.

Application Notes

Applicable Revision	Project ID	NASA Center	Creation Date	Note
-	-	JPL	4/26/2001	Requires that each facility have a document that describes how they implement ESD controls (for example, see MSFC-RQMT-2918).

Lessons-Learned and Best-Practices

LL/BP No.	Title	Date	Relevance to the Standard
685	Electrostatic Discharge (ESD) Control in GSE	2/1/1999	The Lesson provides technical recommendations for the control of ESD in aerospace equipment.
732	Electrostatic Discharge (ESD) Control in Flight Hardware	2/1/1999	The Lesson addresses the generation of triboelectric and electrostatic charges as a common cause of damage and/or degradation to unprotected Electrostatic Discharge Sensitive (ESDS) devices. A carefully devised and implemented ESD control program can provide protection from this damage and/or degradation.

Document History

Document No.	Rev	Date	Title	Status
MIL-STD-1686B	B	12/31/1992	ELECTROSTATIC DISCHARGE CONTROL PROGRAM FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES AND EQUIPMENT (EXCLUDING ELECTRICALLY INITIATED EXPLOSIVE DEVICES) (S/S BY MIL-STD-1686C) (SUPERSEDING MIL-STD-1686A)	Superseded
MIL-STD-1686A	A	08/08/1988	ELECTROSTATIC DISCHARGE CONTROL PROGRAM FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES AND EQUIPMENT (EXCLUDING ELECTRICALLY INITIATED EXPLOSIVE DEVICES) (METRIC) (S/S BY MIL-STD-1686C)	Superseded



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WHERE DO WE GO FROM HERE

Key Actions In Process/Planned

- 1. Pursue Efforts to Make Agency Engineering and Support Contractor Staffs More Aware of Agency-wide Full-Text Technical Standards System Capability and Products.**
- 2. Implement Agency-wide the Standards Update Notification System for Individual Usage and Applications by Program/Project Offices.**
- 3. Expand Integration of Lessons Learned/Best Practices/Application Notes With NASA Preferred Technical Standards and Other Standards**
- 4. Initiate Effort to Provide Identification of Standards Changes Made in Updated and Replacement Standards Documents – Editorial and Technical.**
- 5. Exploit Utility of New Program Website Metrics Information.**

Help Requested

- 1. Assist in Giving Visibility to Program Website and Contents.**
- 2. Visit Program Website, Register and Log on to NASA Access or Public Access Sites, as Applicable, and Provide Feedback, Comments, Suggestions, Usage Experiences, etc.**



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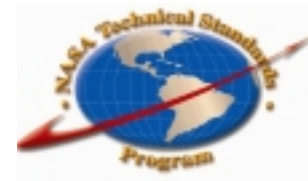


SUMMARY

- **Program Enjoys Strong “Grass Roots” Engineering Support Throughout the Agency**
- **Program’s Website Continues to Experience Increased User Visits – Both for NASA and Public Access Domains**
- **The NASA Integrated Technical Standards Initiative is a Unique Endeavor – Not Duplicated Within Government or Industry**



NASA TECHNICAL STANDARDS PROGRAM



BACK-UP CHARTS



NASA TECHNICAL STANDARDS PROGRAM



NASA Facilities For Which Technical Standards Products Will Be Made Available Via The Agencywide Full-text Technical Standards System

- Ames Research Center (ARC)
- Dryden Flight Research Center (DFRC)
- Glenn Research Center (GRC)
- Goddard Space Flight Center (GSFC)
- NASA Headquarters (HQ)
- Independent Verification and Validation (IV&V) Facility
- Jet Propulsion Laboratory (JPL)
- Johnson Space Center (JSC)
- Kennedy Space Center (KSC)
- Langley Research Center (LaRC)
- Marshall Space Flight Center (MSFC)
- NASA Headquarters
- Stennis Space Center (SSC)
- Wallops Flight Facility (WFF)
- White Sands Test Facility (WSTF)



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STANDARDS DEVELOPING ORGANIZATIONS WHOSE TECHNICAL STANDARDS PRODUCTS WILL BE PROVIDED TO ALL WITHIN <nasa.gov> DOMAIN

AA	ARI	CGA	HI	LIA	NFPA
AAMI	ARINC	CMAA	ICAO	LPI	NIST
AASHTO	ARMY, AIR FORCE, NAVY	CPIA	ICBO	MBBP	NRFC
ABMA	ASA	DESC/SMD	ICEA	MHI	NSC
ACI	ASCE	DIDS/CIDS	IEC	MIL	NSF
ACM	ASHRAE	DIN	IEEE	MIL (Historical)	OMG
AFS	ASME	DOD Adopted VCS	IES	MIL QPL/QML	RAC
AGA	ASME-BPVC	ECSS	IESNA	Miscellaneous	RTCA
AGMA	ASNT	EIA/TIA	IETF	MS/AN/ANA	SAE
AIAA	ASQ	EJMA	IFI	MSS	SEI
AIA/NAS	ASTM	EOS/ESD	IHS	NASA	SEMI
AIIM	ATA	FAA	IPC	NACE	SIA
AISC	AWS	FED	ISA	NCCLS	SMACNA
AISE	AWWA	FED QPLs	ISEA	NCITS	SMPTE
AISI	BS	FIPS	ISO	NCSL	SSPC
ANSI	CEN	FMRC	ISS	NEMA	UL
API	CCITT	H4-H8 Cage Codes	ITU	NETA	VITA
AREMA	CCSDS	HFES	JIS	NFP(A)	WRTB



NASA TECHNICAL STANDARDS PROGRAM



NASA Preferred Technical Standards Categories

Documentation and Configuration Management, Program Management

Configuration & Documentation Mgmt, Packaging, shipping & Handling, Reproduction & Document Archiving

Systems Engineering and Integration, Aerospace Environments, Celestial Mechanics

Orbital & Celestial mechanics, Aerospace Environments, System Engineering and Integration

Computer Systems, Software, Information Systems

Computer Design (Flight & Ground), Software Design (Flight & Ground), Computer & Software Security, Information Systems(ADP) & Network Communications Design

Human Factors and Health

Ergonomics, Health Science

Electrical Systems, Electronics, Avionics/Control systems, Optics

Electrical / Electronic Design including Printed Circuit Boards & Electrical Ground & Airborne Support Equipment
Electromagnetics and Electrical Discharge Control Guidance & Control, & Optics

Structures/Mechanical systems, Fluid, Thermal, Propulsion, Aerodynamics

Structural Design including Stress Corrosion control, Mechanical Design Including Mechanical & Propulsion Ground and Airborne Support Equipment, Propulsion Design, Thermal Design, Flight & Fluid Dynamics

Materials and Processes, Parts

Materials & Materials testing including Fluids & Propellants, Material Processes, manufacturing, Parts (Mechanical, Electrical, Optical)

System Test, Analysis, Modeling, Evaluation

System and Subsystem testing including Environmental testing, Test Evaluation, Analysis and Modeling

Safety, Quality, Reliability, Maintainability

Safety (Flight, ground, Personnel and Equipment), Quality (Hardware and Software), Reliability (Hardware and Software)
Maintainability (Hardware and Software)

Operations, Command, Control, Telemetry/Data Systems, Communications

Flight and Ground Operations, Mission Command & Control, Telemetry and Data Systems Design, RF Communications Design

Specifications and Standards for use on Construction Projects (SPeCSINTACT)

Facilities Design, Roads and Grounds Support (Local transportation, fire control, Telephones, Health Care, Etc.)



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TYPES OF TECHNICAL STANDARDS PRODUCTS*

Technical Standards: Documents that establishes uniform engineering and technical requirements for processes, procedures, practices, and methods that have been adopted as standard, including requirements for selection, application, and design criteria of an item.

Specifications: Documents prepared specifically to support acquisition which clearly and accurately describes essential technical requirements for purchased items. Procedures necessary to determine that the requirements covered by the specification have been met are also included.

Handbooks: Authoritative engineering, technical, or design information and data relating to processes, procedures, recommended practices, and methods. Non-Government handbooks are the result of the consensus process and may evolve into standards through application and industry acceptance.

Guidelines: Technical information in support of Standards, Specifications, and Handbooks. Guidelines provide instructions and data for the application of standards and recommended practices, procedures, and methods. Recommended Practices are in this category, as well as preliminary standards.

Regulations: An Action Issued by a Government Agency That May Use or Reference Standards

Codes: A group of standards dealing with one subject such as fire, electrical, building, plumbing, boilers, etc.

*NASA Usage Frame of Reference